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Questions discussed are--(1) why should a consultant be hired, (2) what can the consultant do that our own staff and architect cannot do, and (3) what is an educational planning program for a college science facility? Fifteen basic steps involved in the development of the educational planning program are described which help college science faculties, administrators, and architects understand the purpose and value of an educational planning program and the role of the consultant. (HH)

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THE UTILIZATION OF CONSULTANTS FOR THE PLANNING AND DESIGNING OF COLLEGE SCIENCE FACILITIES

A Paper Presented To
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THE UTILIZATION OF CONSULTANTS FOR THE PLANNING AND DESIGNING OF COLLEGE SCIENCE FACILITIES

by
William T. Mooney, Jr. (1)

Before embarking on a "why, what, when, who, where, and how?" analysis of the utilization of consultants to assist colleges and universities in the planning and designing of college chemistry or science facilities one should consider the following. First read the sentence enclosed in the box below:

> FINISHED FILES ARE THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF MANY YEARS

Now count the F's in the sentence. Count them only once and do not go back and count them again. Did you find one F? or two? or three? or four? or five? or six? or seven? or eight? There are six! For those who found less, the average person finds three, please reread the sentence and carefully note the three times "OF" appears. (2) This exercise has two messages for colleges considering new or remodeled chemistry or science facilities.

The first message is found if one revises the "boxed" statement to read "Finished buildings are the result of years of scientific study combined with the experience of many years". The second message comes from the "F" counting exercise. Those little things, called the details, which are important to the proper functioning of the whole, can easily be overlooked in the planning of facilities.

Since most colleges build or remodel major science facilities rather infrequently it is not too probable that there will be on the college faculty, administration, or service staff any person or group of persons who have had the opportunity to devote many years of study to the planning of science buildings or who have been in situations where they could obtain the many years of experience necessary to produce functionally well planned, educationally efficient, and economically feasible facilities. These colleges probably do not have anyone or group aware of all of the important detail considerations either. In many situations the architect and his staff are no more experienced in the planning and designing of college science facilities than are the college staff members. The $64,000 question, often more in savings to the college if properly answered, of what to do initially when you have a college science facility to plan is increasingly being answered by engaging a consultant or a consulting team.

1. "Why should we hire a consultant?"
2. "What can a consultant do that our own staff and architect can not do?"
3. "When, in the planning process, should we engage the consultant?"

4. "Who are some qualified consultants?"
5. "Where do we find out more information about such consultants, what they have done and can do, their fees, etc.?"
6. "How do such consultants work with the faculty, the administration, and the architect?"

These are all questions which one will probably be asked as soon as he suggests to a college staff member or administrator that they consider employing a consultant to assist them in the planning and designing of their new science facility. This paper is devoted to providing information about the use of planning and designing consultants in the development of new or remodeled college science facilities.

This paper has been developed from information obtained from four contemporary consultants, from the Architectural Services Section of the National Science Foundation, and from ten years of experience as a consultant to two-year and small four-year colleges. The professional identifications of the four consultants are as follows:

1. Burgess P. Standley of Laboratory Planning Consultants (3)
2. Donald W. Pavlis of Specialized Area Consultants, Inc. (4)
3. Earl L. Walls of Earl L. Walls Associates-Programmers and Designers of Science Facilities (5)
4. Lester Gorsline of Lester Gorsline Associates-Planning Consultants for Scientific, Health Education and Hospital Facilities (6)

These identifications suggest the nature of the activities and services which such consultants may perform.

The titles of three papers presented by Harold Horowitz and Scott Heider of the Architectural Services Staff of the National Science Foundation suggest some activities of such consultants:

1. "The Architects' Programme and the Behavioral Sciences" (7)
2. "The Program's the Thing" (8)
3. "How to Avoid Mechanical Design Problems in Laboratory Facilities" (9)

The term, College Science Consultant (1), is about the most descriptive one which can be applied to the activity of the author in this area for his experiences have been in all phases of building planning and designing: developing educational specifications, curriculum development, and equipment specifications.

Why Should We Hire A Consultant?

The consultant, if the proper one for a particular college, will be of invaluable assistance to the college and the architect in arriving at the optimum architectural solution to the particular educational problem posed by the need for a new or remodeled science facility. The term, optimum solution, is defined as that particular solution, from among the set of all possible solutions,

which will maximize educational efficiency and economic feasibility. This solution especially in college science facilities, will be a unique one because it must represent a building which will house and service a unique set of philosophies, programs, policies, and persons.

"What Can The Consultant Do That Our Own Staff And Architect Can Not Do?"

A consultant can do many things which will insure that the planning, designing, detailing, and construction of the facility will proceed more effectively and efficiently, among which are these six:

1. He can cause the planning process to become properly organized.
2. He can see that the important considerations, both general and detailed, are taken up at the proper time.
3. He can see that various options are considered each time the staff and architect are faced with making decisions.
4. He can serve as the continuity in the project from initial planning through punch list checking.
5. He can serve as the bridge between faculty, administration, architect, contractor, supplier, etc.
6. He can serve as the programmer for the project, and one should not underestimate the importance of this role. Horowitz has stated that buildings are the physical manifestation of programs and that only with programs full in scope and fine in detail are we assured chances of design solutions that accommodate and delight. (8)

More specifically colleges and architects should be advised that such consultants may be engaged to do any one or combination of the following:

1. Organize the planning process for effective decision making.
2. Develop the educational planning program for the project.
3. Develop the architectural planning program for the project.
4. Develop a detailed set of specifications for the laboratory furniture and equipment and services for the project.
5. Prepare working drawings and specifications suitable for bidding.
6. Check the shop drawings of the laboratory furniture and equipment contractors and inspect the installed installation for completeness, thoroughness and accordance with bid documents. Such service goes through the punch list visit and acceptance by owner stage.

Colleges should also be advised that some consultants are stronger than others in certain of these phases or services and that they should carefully analyze the particular situation of the college's need, its staff, and its architect and their experiences and capabilities and then select the consultant or develop a consulting team that will best serve their situations. Such analysis should consider

1. The experience of the consultant firm or team with similar types of institutions.

2. The personnel of the consulting firm who will be working with the college and the architect, particularly their experience with similar situations.
3. The method of operation of the consultant.

What Is An Educational Planning Program For A College Science Facility?

Because too little attention is generally given to the development of an educational planning program for a facility the remainder of this paper will concentrate on this aspect.

To maximize the benefits received from the time and effort devoted to the planning and designing of a new science facility an Educational Planning Program (EPP) should be developed. This should include what is commonly referred to as educational specifications but, because of the developmental process and the informational substance of the EPP as described herein, it will be of considerably more value than most educational specifications to the college administration, the college faculty, the architects, and any consultants utilized by the architects or the college in the planning and designing of the new science facility. To insure that the maximum benefits to the particular project are realized from an Educational Planning Program the college or the architect or two together should be advised to seriously consider engaging a Consultant experienced in the development of an Educational Planning Program which will describe in some detail the unique educational problem for which an architectural solution is being sought. This should not be confused with the architect's Program for the project although it is closely related to it.

The development of the EPP may be in one of two ways. Option A may be called the Report Option and Option B the Process Option. Experience has shown that some planning situations will best be served by the College Science Consultant collecting the necessary information, preparing the Educational Planning Program, and submitting it to the college or the architect or both as a formal report. This is what is meant by the Report Option.

Experience has also shown that other situations will best be served by the College Science Consultant guiding the client group, which may include members of the college science faculty and the college administration plus representatives of the architect, if selected, and any other groups involved in the project. The guidance which the Consultant can give consists of taking the client group through the proven steps in the development of the EPP with the only report resulting from the process being that developed by the client group for their own internal use in the planning and designing of the new facility.

The considerations included in the development of the EPP are the same for either of the options. These considerations and the order of their treatment in the planning process are described below.

The development of the EPP is the key phase in the planning of science facilities for colleges. Among the benefits which the client group receives from the development of an EPP are a saving in the total time and effort required for planning and designing the facility, the attainment of a high level of educational efficiency once the facility is utilized, economic savings, and intergroup and intragroup understandings which promote a smoother planning and designing

operation by minimizing the efficiency-decreasing and time-consuming conflict within the planning group.

There are fifteen basic steps involved in the development of the Educational Planning Program and in order that college science faculty and administrators and architects might have a better understanding of the EPP and its value these steps are described below.

(1) The Problem

A brief statement of the educational problem requiring an architectural solution should be developed and agreed to by the responsible planning group.

(2) Purposes of the Educational Program of the College

A brief statement of the purposes (including functions and objectives) of the educational program of the college should be developed and the implications of these purposes to the educational program in the sciences should be carefully considered and stated and agreed upon by the responsible planning group.

(3) "Philosophy of Education" in the Sciences

A brief statement should be developed describing what the college faculty and administration really believe their "way of life" and "role" to be in education in the sciences. This should include consideration of the instructional methods which they believe will enable them to optimally achieve the purposes outlined. This statement is one which the planning group should develop and subscribe to.

(4) The Educational Program in Science - Curricula and Courses

A description of the curricula in the sciences which the new facility must serve should be developed. This must include not only the general characteristics of the curricula and courses for science and closely related majors but also an analysis of the ways in which the sciences will be expected to contribute to other curricula. This should include considerations of time and emphasis as well as degrees and disciplines.

(5) Pertinent College Policies

All college policies which affect or influence the planning, design and utilization of the science facility should be identified and listed. The client group should be advised how failure to commit themselves to such policy statements at this point in the planning process will result in much lost time, confusion and disagreement because of differing interpretation or misunderstanding. In cases where the college has not yet developed a particular policy the Consultant can assist them in analyzing the situation and in arriving at a policy, as the client desires.

(6) Personnel

All personnel expected to work, study in , or otherwise make use of the facility should be identified, as functional groups, and characterized

by their functional relationship to the various parts of the facility. Major groups considered should be students, faculty, technical assistance, administrative personnel, secretarial and clerical personnel, instructional assistants, building service personnel, and the public.

(7) Projection of Program and Personnel to Estimated Saturation

A quantitative projection of the program, curricula and courses, and personnel, all functional groups, which will be involved in the utilization of this facility should be made in terms of the satisfaction of the minimum and maximum itulization desired for the facility at the estimated saturation date.

Before proceeding with the remaining eight steps in the development of the EPP I should like to call to your attention that up to this point we have not talked facilities at all in the EPP. For this reason it is important to select a consultant, experienced and knowledgeable about trends and practices in education in the sciences in similar and related institutions. Such a consultant will be able to serve the college by (1) insuring that each step is properly and completely considered, (2) raising questions about items which appear to have been omitted from consideration or which appear to have built-in conflicts, and (3) suggesting trends which need to be considered. He will also be able to guide the college to sources of information and to examples of various scientific educational ideas and practices in action.

Now to return to the eighth step in the development of the EPP and we begin to consider spaces in the new facility.

(8) Determination of Kinds of Spaces Required

A non-quantitative listing of the various kinds of spaces required in the facility should be developed. These kinds of spaces should be determined by a review of the functional requirements for the facility and the characteristics of the occupant personnel as developed in previous steps. The list of kinds of spaces should be developed in terms of the general functional types of spaces found in college science facilities: direct instructional, auxiliary instructional, instructional service, faculty, administrative, building service, and corridors.

(9) Numbers of Spaces Required

The policies and program and personnel projections should be carefully analyzed to determine the number of each kind of space which will be required in this new facility.

(10) Specific Functions of Spaces

A detailed analysis of the specific functions to be performed in each of the spaces should be made and a concise statement of these functions, space by space, should be developed.

(11) Relationship Among the Spaces

An analysis of the necessary and desirable relative locations of each of the spaces should be made in terms of the interrelationships of functions,

(12) Size of Spaces

The determination of the area to be assigned to each space listed for the new facility should be made in terms of the number of persons who will work in the space, the functions they will perform therein, and the accepted space standards for such a group to perform such functions in an adequate and acceptable manner. The size of each space should be communicated in terms of square footage and number of occupants.

(13) Specifications For Each Space

A detailed statement of specifications for each space should be developed. This should include information, from a functional and standard of operation point of view, on the essential architectural features, equipment and utility services for each of the listed spaces. It is very difficult to hold college faculty members off so long on this point, but an experienced consultant can do it skillfully and to great advantage. The consultant with his experience and check lists can insure that all such features, equipment and services are properly considered and specified.

(14) Phasing of the Construction

When the economic and growth specifics of a planning situation require it, an analysis of the program and personnel projections and the list of recommended spaces should be made and a statement recommending what spaces should be included in what phases of the construction developed. Recommendations concerning optimum utilization of each space during each phase should be included.

(15) Summary

A summary statement for the EPP should be developed including recommendations concerning (1) the budget for the facility, as proposed; (2) the flexibility desired or possible to accommodate future growth or function change; (3) and the need for and establishment of priority or value judgements among the various requirements.

The Architect's Program

Horowitz has stated "while it is agreed that the successful design solution is one that translates the needs of the building's user, as expressed in the program, into a significant physical form, we find beyond this point of accord broad areas of confusion and disagreement on three counts: (1) responsibility for the program, (2) degree of program detail and (3) program format.

> "Program instruments vary considerably in both context and format... for one building type, the science building, programs are often of poor quality or are absent all together.
>
> "There is, moreover, a difference of opinion over whose responsibility it is to prepare the program instrument. Some believe the client should and others the architect." (8)

Horowitz has also suggested several considerations which should be added to those of the EPP. (3) The combination of these might be considered the Architect's Program, or a good portion of it.

A complete, yet concise statement of the building problem must be made. This will include information related to:

(1) Objectives of the master plan and the way in which the master plan relates to the proposed building in such terms that there is no question regarding criteria that must be followed with little deviation and also, the matters where the architect has a fair degree of design freedom.
(2) Special restrictions and limitations on design. These must be understood at the beginning of the design studies.
(3) Characteristics of the site.
(4) Site development requirements.

The consultants can insure that such information is identified, stated, and agreed to, or at least made known to, all parties concerned with planning.

At this point the planning process for the facility is ready to move from the programming phase into the designing phase. Whereas the college staff was participating at the highest level of activity and the architect at a lower level the roles are reversed in the designing phase. The role of the consultant changes from one of questionner, stimulator, and organizer to one of interpreter, detail designer, specifier, and reviewer or critiquer.

From my review of this field and after ten years experience as a College Science Curriculum and Facility Consultant I would urge that colleges be advised that an experienced consultant or consulting team be employed to prepare the program or at least to be the key advisor(s) in its preparation.

FOOTNOTES

(1) The author, William T. Mooney, Jr., has been a member of the chemistry faculty of El Camino College since 1950 and served as Dean of the Division of Physical Sciences from 1954-1966. He originated the Two-Year College Chemistry Conference program of the Division of Chemical Education, American Chemical Society, in 1961 and has served as its chairman since that time. He has been a member of the Advisory Council on College Chemistry since 1965. He has served as a College Science Consultant for ten years, during which period he has assisted more than 45 colleges in Arizona, California, Illinois, Michigan, North Carolina, Ohio, Texas and Washington in the planning and designing of their science curriculum and facilities. He has worked directly with colleges, architects, and State Departments of Education and has also worked as a member of a consulting team with consulting firms such as those listed in the paper.

(2) This exercise appears on a "Test Year Sensitivity" card distributed by Advance Seminars, 1725 Beverly Boulevard, Los Angeles 26, California.

(3) Address: Burgess P. Standley, Laboratory Planning Consultants, 75 Elm Street, Medfield, Mass., 02052.

(4) Address: Donald W. Pavlis, President, Specialized Area Consultants, Inc., 1410 Higgins Road, Park Ridge, Ill. 60068.

(5) Address: Earl L. Walls, Earl L. Walls Associates, 7460 La Jolla Boulevard, La Jolla, California 92037.

(6) Address: Lester Gorsline, Lester Gorsline Associates, 1550 Tiburon Boulevard, P.O. Box 407, Belvedere-Tiburon, Calif. 94920.

(7) Harold Horowitz. "The Architect's Programme and The Behavioral Sciences." Architectural Science Review, vol. 9, no. 3 (September, 1966), pp. 71-79.

(8) Harold Horowitz. "The Program's the Thing." AIA Journal, May 1967, pp. 94-100.

(9) Scott Heider. "How To Avoid Mechanical Design Problems In Laboratory Facilities." Heating, Piping and Air Conditioning, April 1967, pp. 118-123.